Foresight for sectoral development. Sectoral development as a 'Third Mission' activity at the Technical University of Denmark.

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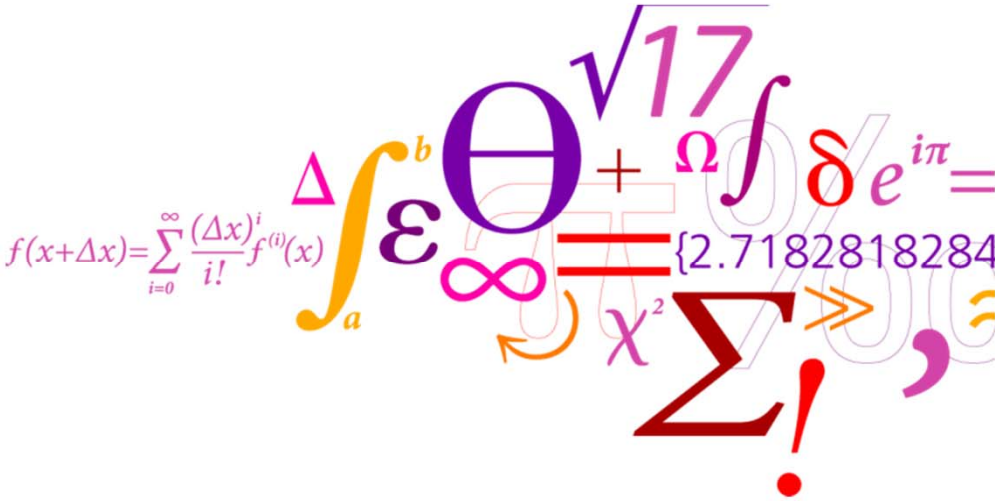

DTU Management Engineering
Department of Management Engineering

Practical problem
- designing a sector development

Practical problem – **specific motivation**

- DTU has recently pursued a sector-oriented strategy to supplement its direct industry and public sector activities
- The main intention is to identify and pursue ideas for the development of industrial sectors in collaboration with industry associations, ministries, and other stakeholders. The aims are:
    1. Define and promote ‘strategic’ technological areas;
    2. Point out barriers and opportunities in the ‘framework conditions’ for sectors;
    3. Decision support for management and optimization;
    4. Secure the knowledge foundations and infrastructure of sectors.

Practical problem – **generic motivation**

- Sector-oriented innovation system foresight exercise
- A sector – not a single company or a national foresight

Theoretical problem
- theoretical framework

The gap in foresight literature:

- The theoretical rationale for foresight exercises supported by the innovation-systems framework (e.g. Martin & Johnston, 1999; Georghiou & Keenan)
- But, with few exceptions (e.g. Weber, Schaper-Rinkel, & Butter, 2009), innovation-oriented foresight at the sector-level is unexplored in literature.

The gab in Third Mission' literature:

- Universities' *third mission* is not fully conceptualized nor is the practical implementation of the concept (e.g. Molas-Gallart & Castro-Martínez, 2007; Laredo, 2007).

- The study (and this paper) is one of several contributions to the development of the sectoral innovation system foresight:
  - Conceptual consideration on innovation system foresight (ISF)
  - Lessons from Brazilian & Korean sectoral innovation system foresight
  - Facilities Management sectoral innovation system foresight '
  - EcoWindS – FP7 project Offshore Wind Service Sector
  - Agri-food sectoral foresight & strategizing, Etc.

Two main research questions

The main research questions for this paper are

1. what are the contributions of innovation system foresight (ISF) to sector development and third mission activities in general ?

2. what can be learn from DTU's experiences with (sector) innovation system foresight ?

Research design – 1
- case design and data collection

Four case studies:

1. Cleaning technology in the food sector (project completed)
2. New materials (not really a sector)
3. Mold prevention in the construction sector (project delayed)
4. Aerospace infrastructure (project almost completed)

Projects – and cases – are expected to be completed later this year

Empirical part based on:

- Reports and other written material
- Interviews with key persons

Research design – 2
- template for case descriptions

	Indicator / characteristic
Foresight content	• Motivation
	• Thematic class
	• Horizontal vs. vertical
	• System level
	• Time horizon
	• Rationale/goal
	• Output (tangible)
Foresight process	• Customers
	• Exclusive vs. extensive inclusion
	• Number of participants
	• Diversity of participants
	• *Sponsors*
	• Duration of foresight
	• Output (intangible)

Inspired by: Barré, 2002; EFMN, 2009; Keenan & Popper, 2008; Porter, 2010; Yuan, Hsieh, & Chang, 2010.

What is universities' Third Mission ??

- Two first missions: academic research and higher education

- Third Mission: generation, use, application and exploitation of knowledge and other university capabilities outside the academic environment (Molas-Gallart & Castro-Martínez, 2007).

- The E3M project identified the Third Mission activities as

1. Research, development and innovation (RDI) and technology transfer;
2. Continuing education besides degree programs, i.e. life-long learning;
3. Social engagement and dialogue with the society through consultancy, expert advice, public access to teaching etc.

(*Green Paper: Fostering and Measuring "Third Mission" in Higher Education Institutions*, n.d. 2012?)

European Indicators and Ranking Methodology for University Third Mission

Education and Culture DG
Lifelong Learning Programme

Examples of Third Mission activities

Third mission category	Examples of activities/services
1 **Research, development, innovation** **(RDI)**	• IP creation and transfer, licensing, • Student training, capability creation • Consultancy and advisory, • Commissioned research, • Collaborative research, knowledge co-creation and transfer to industry • Support for entrepreneurship and commercialization of research, spin-offs • International and domestic partnering and expert matchmaking services
2 **Continuing education**	• Industrial PhD programs, capability creation • Education and training, MBA programs • Open access teaching materials, • Access to scientific infrastructure, libraries, databases, laboratories, facilities
3 **Social engagement and dialogue**	• Campus visits, open days • Science camps, science fairs, Museums • Media and web involvement, dialogue • Student and staff involvement to cultural life (externality) • Consultancy and advisory in policy making

Sectoral innovation foresight - contribution third mission

- Universities foresight activities fall easily into the category 3) social engagement and dialogue.

- However,

Foresight's contribution to universities' Third Mission activities

Generic foresight activity	Aims	Foresight's contribution to Third Mission
Thinking about the future ***cognitive dimension***	• to identify innovation policy priorities on the basis of scenarios of future developments in science, technology, economy and society	• Social engagement and dialogue • Indirect contribution to RDI • Identifying new trends through research-bases knowledge and expertise • Gaining understanding about the future expectations of the participants
Debating the future ***value judgment dimension***	• to organize open discussion between the participants in order to create a shared understanding.	• Social engagement and dialogue • Gaining insight to the priorities in the society • Networking and scoping partners
Shaping the future ***pragmatic and implementation-oriented dimension***	• to identify possible futures and future developments, imagining desirable futures, and identify strategies that facilitate implementation.	• Indirect contribution to RDI • Identifying research-based solutions • Scoping possible projects and partners

Findings

1) DTU-PSC: DTU's sector development program

- Staff (8) are practitioners, with limited theoretical perspective on sector development

2) Idea generation

- Idea generation happens in a continuous interaction with industry associations and policy makers at regional and national level

- project selection was not based on an analysis of particular sectors properties, challenges, opportunities or futures in general – rather initiated due to interest from industry associations after an initial call from DTU-PSC

Findings

3) Innovation 'height' and conflict of interest

- DTU-PSC focus on high-technology areas and firms because only these can engage in projects with research potential.
- Sector innovation is considered more about knowledge diffusion, and therefore not an area of interest for DTU

- This science focus directly conflicts with the intentions of the sector development program.
- However fit with the analysis of third mission orientation in Continental European presented by the E3M Project

Findings

4) Lack of articulation

- Industry associations are not optimal partners:
  1. they most often do not represent a homogeneous group of firms (a meaningful sector)
  2. they do most often not see it as their role to facilitate university-industry interaction,
  3. they do not seem to have the necessary competences to engage in such projects because the staff hired is mainly generalists trained in social science with no detailed information about and understanding of the reality of firms

- Difficult to establish meaningful interaction between DTU-PSC and industry associations as the staff at both parts is are generalists and not engineers with knowledge about technological issues

Conclusion - 1

RQ 1) what are the contributions of innovation system foresight (ISF) to sector development and third mission activities in general ?

- sectoral innovation foresight supports the ‘strengthening’ of sectoral innovation systems, through
  - mapping the sectoral innovation system
  - building new networks and linkages
  - bringing new actors into the strategic debate
  - exploring future opportunities to set priorities for investment in science and innovation activities.

- main benefit from innovation systems foresight might come from the process of foresight.

Conclusion - 2

RQ 2) what can be learn from DTU's experiences with (sector) innovation system foresight

- Structural barriers to sector innovation foresight, the most important being articulation of demand and securing commitment to the foresight.
  - > Foresight and consortium design needs careful attention.

- (Traditional) science and technology foresight have limitations when trying to support development of sector innovation systems.
  - > Important to understand the systemic nature of innovation and its role in sectoral development.
  - >Universities must understand their role within the larger innovation system in order to fulfill the potential of sectoral development and by extension their third mission.

Thank you for your attention